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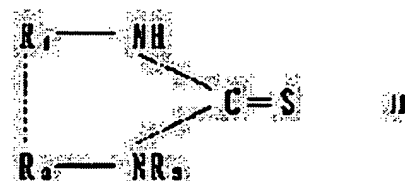
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(54) NEAR-INFRARED-ABSORBING STYRENE RESIN COMPOSITION AND MOLDED ARTICLE THEREOF

(57)Abstract:

PURPOSE: To prepare the title compsn. which has an improved near-infrared absorptivity while transmitting visible rays relatively well by compounding a styrene resin, a specific copper compd., and a thiourea deriv. and/or a thioamide deriv.

CONSTITUTION: 100 pts.wt. styrene resin is compounded with a copper compd. selected from the group consisting of those of formula I [wherein R is H or a monovalent group selected from the group consisting of (cyclo)alkyl, aryl, aralkyl, and heterocyclic groups; X is -COO, -SO₄, -SO₃, -PO₄, or -O; and u is 1-4], copper chlorophyll, copper chlorophyllin sodium, and copper bisacetylacetonate and 0.05-50 pts.wt. thiourea deriv. of formula II [wherein R₁, R₂, and R₃ are each H, (cyclo)alkyl, aryl, aralkyl, or 5- or 6-membered heterocyclic] and/or thioamide deriv. of formula III (wherein R₄ is R₁; and R₅ is R₁ or alkoxy) to give the title compsn., which is formed into a film or sheet having a thickness of 0.01-10mm.



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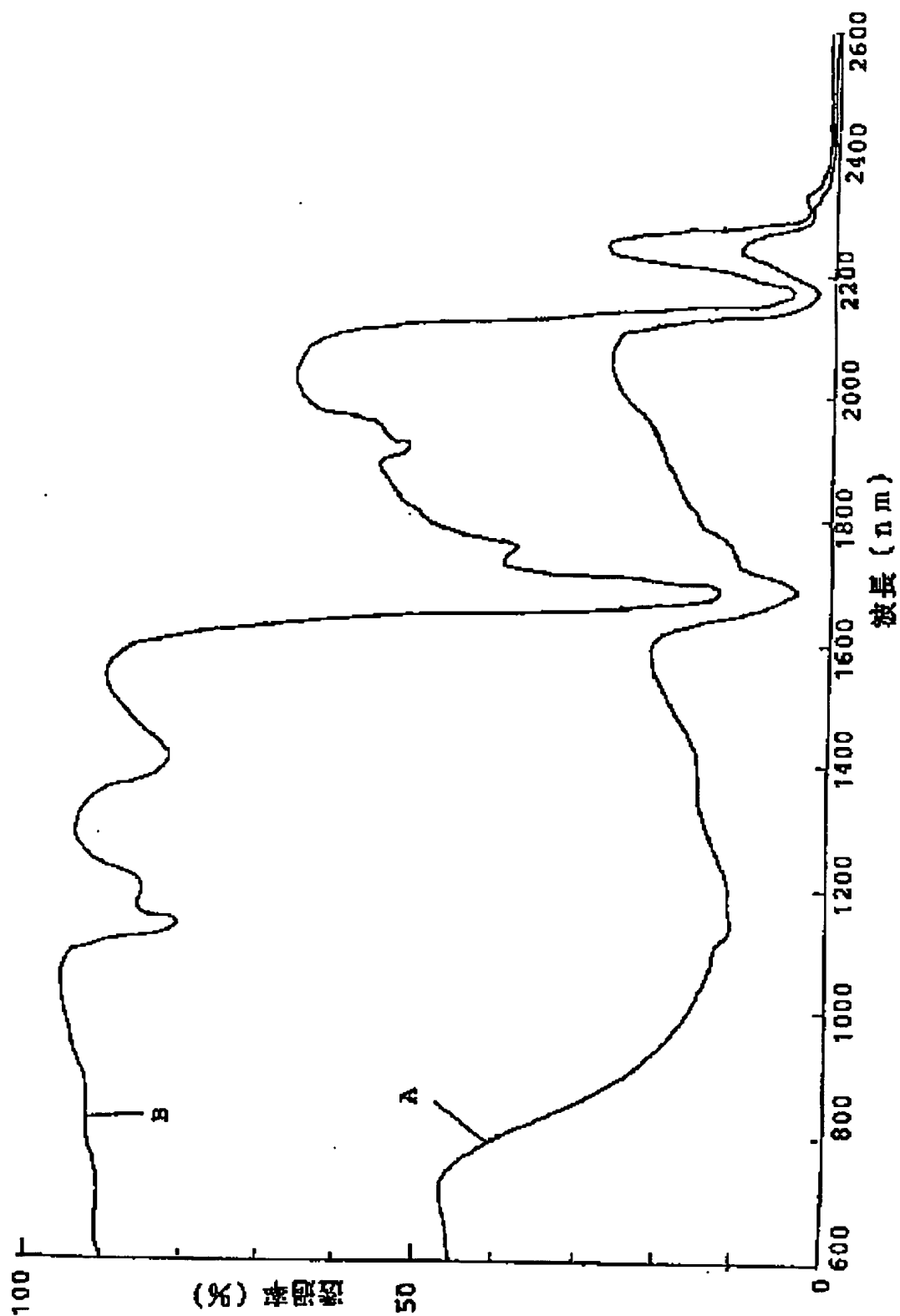
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CLAIMS

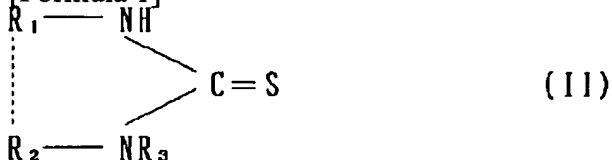
[Claim(s)]

[Claim 1] (A) Styrene resin It is (B) to the 100 weight sections. The following general formula (I)

(R-X)_nCu (I)

R among [type Hydrogen, an alkyl group, a cycloalkyl radical, an aryl group, Monad and X which are chosen from the group which consists of an aralkyl radical and heterocycle residue (each radical may have one or more substituents) - COO, -SO₄, -SO₃, -PO₄, and -O, n At least a kind of copper compound 0.05 chosen from the group which consists of the copper compound expressed with integer] of 1-4, chlorophyll copper, sodium copper-chlorophyllin, and bisacetylacetonate copper - 5 weight sections, and (C) The following general formula (II)

[Formula 1]



(R₁, R₂, and R₃ may express the monad chosen from the group which consists of the heterocycle residue of hydrogen, an alkyl group, a cycloalkyl radical, an aryl group, an aralkyl radical and 5 members, or 6 members, each radical may have one or more substituents, R₁, R₂, or R₂ and R₃ may connect, and they may form a ring) The thiourea derivative shown and the following general formula (III)

[Formula 2]



R₄ and R₅ -- hydrogen, an alkyl group, an alkenyl radical, and a cycloalkyl radical -- The monad chosen from the group which consists of the heterocycle residue of an aryl group, an aralkyl radical and 5 members, or 6 members is expressed. R₅ may also express an alkoxy group further and each radical may have one or more substituents. R₄ and R₅ may connect and they may form a ring. Near infrared ray absorption styrene resin constituent characterized by the thing which is chosen from the thioamide derivative shown, and which contain at least one sort of 0.05 - 50 weight sections, and changes.

[Claim 2] The near infrared ray absorption styrene resin organizer which a near infrared ray absorption styrene resin constituent according to claim 1 is fabricated a sheet or in the shape of a film, and changes.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Industrial Application] This invention penetrates a visible ray comparatively well, and relates to the near infrared ray absorption styrene resin Plastic solid which is fabricated the shape of a new styrene resin constituent and a sheet, or a film excellent in near infrared ray absorbing power, and changes. Researches and developments are the functional material currently performed briskly, and especially the charge of a near infrared ray absorber can be used recently as optical materials, such as information record ingredients, such as sensitive material which makes the light source semiconductor laser light which has the wavelength of a near infrared region, and a record ingredient for optical disks, an infrared cut filter, and a film, and a heat ray absorptivity grading ingredient.

[0002]

[Description of the Prior Art] It is tungsten hexachloride as conventionally shown in a U.S. Pat. No. 3692688 specification as a light transmission nature ingredient of near infrared ray absorptivity. (WCl₆) The ingredient excellent in the near infrared ray absorbing power which dissolves tin chloride (SnCl₂·2H₂O) in methyl-methacrylate syrup (monomer), and is acquired by carrying out a polymerization and which does not have Hayes substantially is known. Furthermore, in addition to this as a charge of a near infrared ray absorber developed until now, it is [JP,61-218551,A / an anthraquinone derivative and] in a thiol nickel complex and JP,61-115958,A to chromium, cobalt complex salt, and JP,60-21294,B in JP,60-42269,B. 700-800nm The new squarylium compound which has absorption maximum wavelength in a field is indicated.

[0003]

[Problem(s) to be Solved by the Invention] although the conventional charge of a near infrared ray absorber had the trouble that as for the thing of an organic system endurance be bad and early capacity deteriorated in connection with change and the passage of time of an environmental condition and the thing of a complex system be durable on the other hand , there be a problem that there will be much what not only the near-infrared section but a visible region have absorption , and the compound itself be color strongly , and an application will be restrict . Furthermore, on the wavelength as which the absorption peak was regarded in specific wavelength and both of the things of a system shifted [wavelength] from the peak, it was what absorbing power does not almost have. If the record object which makes the light source laser light which has the wavelength of the near-infrared section is considered using these materials, it is necessary to double the wavelength of a laser line, and the absorption peak of an ingredient. However, the combination with which also in the wavelength of a laser line the wavelength of a laser line and the wavelength in the absorption peak of the charge of a near infrared ray absorber agree since only that to which the absorption wavelength of the charge of a near-infrared absorber was also restricted is obtained could not but become a ***** thing.

[0004] Moreover, WCl₆ of the above-mentioned conventional technique The constituent which dissolved SnCl₂·2H₂O in methyl-methacrylate syrup colored in dark blue, and although it had the property which absorbs a near infrared ray well, it had the trouble of carrying out tenebrescence between prolonged neglect in a dark place. Thus, the photochromism which advances gently was a trouble which is not desirable when offering the industrial products equipped with fixed quality, such as a light filter and heat ray absorptivity grading.

[0005]

[Means for Solving the Problem] Absorption was seen uniformly in this invention and the 800-2000nm whole near

infrared region, as a result of coloring repeating examination wholeheartedly about the charge of a near infrared ray absorber in which endurance was excellent few, by making a copper compound, a thiourea system derivative, or (reaching) a thioamide system derivative contain in styrene resin, it found out that the outstanding charge of a near infrared ray absorber made into the purpose was obtained, and this invention was completed.

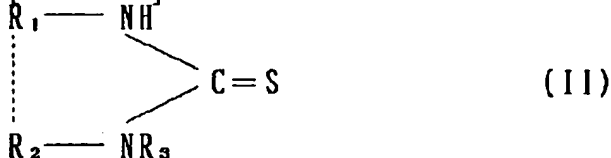
[0006] That is, this invention is (A). Styrene resin It is (B) to the 100 weight sections. The following general formula (I)

(R-X)_nCu (I)

R among [type Hydrogen, an alkyl group, a cycloalkyl radical, an aryl group, Monad and X which are chosen from the group which consists of an aralkyl radical and heterocycle residue (each radical may have one or more substituents) - COO, -SO₄, -SO₃, -PO₄, and -O, n At least a kind of copper compound 0.05 chosen from the group which consists of the copper compound expressed with integer] of 1-4, chlorophyll copper, sodium copper-chlorophyllin, and bisacetylacetonate copper - 5 weight sections, and (C) The following general formula (II)

[0007]

[Formula 1]



[0008] (R₁, R₂, and R₃ may express the monad chosen from the group which consists of the heterocycle residue of hydrogen, an alkyl group, a cycloalkyl radical, an aryl group, an aralkyl radical and 5 members, or 6 members, each radical may have one or more substituents, R₁, R₂, or R₂ and R₃ may connect, and they may form a ring) The thiourea derivative shown and the following general formula (III)

[0009]

[Formula 2]



[0010] R₄ and R₅ -- hydrogen, an alkyl group, an alkenyl radical, and a cycloalkyl radical -- The monad chosen from the group which consists of the heterocycle residue of an aryl group, an aralkyl radical and 5 members, or 6 members is expressed. R₅ may also express an alkoxy group further and each radical may have one or more substituents. R₄ and R₅ may connect and they may form a ring. It is related with the near infrared ray absorption styrene resin constituent characterized by the thing which is chosen from the thioamide derivative shown, and which contain at least one sort of 0.05 - 50 weight sections, and changes. Moreover, this invention relates to the near infrared ray absorption styrene resin Plastic solid which the near infrared ray absorption styrene resin constituent which consists of the aforementioned presentation is fabricated a sheet or in the shape of a film, and changes.

[0011] Although what the rubberlike substance is also made to exist if needed using a kind of monomer chosen from each group which changes from this monomer and other vinyl monomers which can be copolymerized to a styrene monomer list further at least, and is obtained is shown, the styrene resin used in this invention Among those, a styrene monomer first names generically styrene, alpha methyl styrene, the styrene derivative with which the hydrogen atom of a benzene nucleus was permuted by the alkyl group of a halogen atom or carbon numbers 1-2. If a thing typical as this styrene monomer is illustrated, they will be styrene, o-KURORU styrene, p-methyl styrene, 2, and 4-dimethyl styrene or t-butyl styrene.

[0012] moreover, to a thing typical as other above mentioned vinyl monomers which can be copolymerized Acrylonitrile, alpha-chloro acrylonitrile, or the acrylonitrile system monomer like cyanidation vinylidene; (meta) An acrylic acid, (Meta) A methyl acrylate, an ethyl acrylate (meta), butyl acrylate (meta), (Meta) Metaglycidyl acrylate, acrylic-acid (meta)-2-ethylhexyl butyl, or (meta) the acrylic acid like acrylic-acid-beta-hydroxyethyl (meta), (Meta) And those various ester acid; or vinyl acetate, a vinyl chloride, a vinylidene chloride, vinyl pyrrolidone, acrylamide

(meta), a maleic anhydride, itaconic acid anhydride, or maleimide is begun, and there is vinyl ketones or vinyl ether. [0013] Furthermore, in a thing typical as the above mentioned rubberlike substance, it is conjugation like isoprenes including polybutadiene rubber, styrene butadiene styrene block copolymerization rubber, ethylene-propylene terpolymer system rubber, butadiene acrylonitrile copolymerization rubber, isobutylene isoprene rubber, acrylic rubber, styrene isobutylene butadiene copolymerization rubber, or isoprene acrylic ester system copolymerization rubber, or a chloroprene. Although there is rubber obtained using 1 and 3-diene system monomer, these are used in a kind or two sorts or more of combination. Moreover, these styrene resin could be manufactured with what kind of polymerization methods, such as emulsification and massive suspension, or continuation massive.

[0014] Moreover, although the following can be illustrated as a copper compound shown by the above-mentioned general formula (I) used by this invention, it is not limited to these.

Stearin acid copper, PANAMICHIN ****, copper oleate, behenic acid copper, lauryl ****, Capric-acid copper, caproic-acid copper, valeric-acid copper, isobutyric-acid copper, butanoic acid copper, propionic-acid copper, Copper acetate, formic-acid copper, copper hydroxide, benzoic-acid copper, alt.toluic-acid copper, meta-toluic-acid copper, Para toluic-acid copper, PARATASHA rib chill benzoic-acid copper, alt.KURORU benzoic-acid copper, Dichloro benzoic-acid copper, Tori Krol benzoic-acid copper, p-bromine benzoic-acid copper, p-iodine benzoic-acid copper, o-benzoylbenzoic acid copper, p-nitrobenzoic acid copper, Anthranilic-acid copper, p-aminobenzoic acid copper, oxalic acid copper, malonic-acid copper, Succinic-acid copper, glutaric-acid copper, adipic-acid copper, pimelic-acid copper, suberic-acid copper, Azelaic-acid copper, sebacic-acid copper, phthalic-acid copper, monoester phthalic-acid copper, Copper naphthenate, naphthalene carboxylic-acid copper, tartaric-acid copper, diphenylamine-2-carboxylic-acid copper, 4-cyclohexyl butanoic acid copper, diethyldithiocarbamic acid copper, cupric gluconate, Diethoxy copper, G i-propoxy copper, octylic acid copper, alkylbenzene-sulfonic-acid copper, P-toluenesulfonic-acid copper, naphthalenesulfonic acid copper, naphthylaminesulfonic acid copper, n-dodecylbenzenesulfonic acid copper, a dodecyl copper sulfate, 2, 5-dimethylbenzene sulfonic-acid copper, 2-KARUBO methoxy-5-methylbenzene sulfonic-acid copper, alpha-naphthyl phosphoric-acid copper, G 2-ethylhexyl phosphoric-acid copper, isodecyl phosphoric-acid copper.

[0015] Although the following can be illustrated as a thiourea derivative shown by the general formula (II) used by this invention, it is not limited to these.

1-ethyl-3-phenyl thiourea, 1, 3-diphenyl thiourea, 1, 3-diethyl thiourea, 1-ethyl-3-p-chlorophenyl thiourea, 1-ethyl-3-(2-hydroxyethyl) thiourea, 1-(2-thiazolyl)-3-phenyl thiourea, 1 and 3-distearyl thiourea, 1, 3-dibehenyl thiourea, 1-ethyl thiourea, 1-p-BUROMO phenyl-3-phenyl thiourea, 1-(2-thiophenyl)-3-phenyl thiourea, 1, 3-screw (2-hydroxyethyl) thiourea, 1-p-aminophenyl-3-phenyl thiourea, 1-p-nitrophenyl-3-phenyl thiourea, 1-p-hydroxyphenyl-3-phenyl thiourea, 1, 3-G m-KURORU phenyl thiourea, Ethylene thiourea, thiourea, 1-methyl-3-p-hydroxyphenyl thiourea, 1-phenyl thiourea, 1-m-nitrophenyl thiourea, 1-p-nitrophenyl thiourea, 1-p-aminophenyl thiourea, 1, 3-dimethyl thiourea, 1, 3-dicyclohexyl thiourea, 1-phenyl-3-p-chlorophenyl thiourea, 1-phenyl-3-p-methoxyphenyl thiourea, 1, and 1-diphenyl thiourea, 1, and 1-dibenzyl-3-phenethyl thiourea, 1-phenyl-3-(2-hydroxyethyl) thiourea.

[0016] Although the following can be illustrated as a thioamide derivative shown by the general formula (III) used by this invention, it is not limited to these.

N-methylthio Benz amide, N-phenylthio Benz amide, N-ethyl thio ethyl amide, An N-ethyl thio-p-KURORU Benz amide, N-propyl thio Benz amide, N-ethyl thio stearyl amide, an N-1-(2-thiazolyl) thio Benz amide, N-stearyl thio stearyl amide, N-behenyl thio behenyl amide, Thioacetamide, an N-phenyl-thio-p-BUROMO Benz amide, An N-1-(2-thiophenyl) thio Benz amide, N-behenyl thioacetamide, An N-p-amino phenylthio Benz amide, an N-p-nitro phenylthio Benz amide, An N-p-hydroxy phenylthio Benz amide, an N-m-KURORU phenylthio Benz amide, Thio nicotinamide, a thio acetanilide, O-ethyl-N-phenyl (thio carbamate), A thio Benz amide, a thio-m-nitro Benz amide, thio-p-nitro Benz ANIDO, A thio-p-amino Benz amide, N-methylthio acetamide, N-cyclohexyl Benz amide, N-chloro phenylthio Benz amide, a N-p-methoxy phenylthio Benz amide, N-stearyl thio Benz amide.

[0017] The copper compound, thiourea derivative, or (reaching) thioamide derivative used in this invention being visible and the amount made to contain by setup of the permeability of a near-infrared region can be changed. the addition of a copper compound -- styrene resin the 100 weight sections -- receiving -- 0.05 - 5 weight section -- it is the 0.05 - 2.5 weight section preferably. moreover, the addition of a thiourea derivative -- styrene resin the 100 weight sections -- receiving -- 0.05 - 50 weight section -- it is 0.05 - 10 weight section preferably. moreover, the addition of a thioamide derivative -- the styrene resin 100 weight section -- receiving -- 0.05 - 50 weight section -- it is 0.05 - 10

weight section preferably. Moreover, since it changes with the board thickness when the resin ingredient with which permeability is obtained at this invention is a plate also in the same content, it is necessary to determine a content as the appearance from which the permeability in the board thickness finally set up is obtained.

[0018] It sets to this invention and the addition of a copper compound, a thiourea derivative, or (reaching) a thioamide derivative is styrene resin. As opposed to the 100 weight sections, respectively to the case of under the 0.05 weight section Improvement in near infrared ray absorbing power is not enough, and, on the other hand, the addition of a copper compound is styrene resin. In exceeding 5 weight sections to the 100 weight sections For the improvement in near infrared ray absorbing power, it does not see and the addition of a thiourea derivative or (reaching) a thioamide derivative is styrene resin. In exceeding 50 weight sections to the 100 weight sections, improvement in near infrared ray absorbing power is not found, but there is a possibility that Hayes may occur in an ingredient. In addition, besides the above-mentioned component, reinforcing materials, such as the additive currently generally used if needed, for example, a flame retarder, a thermostabilizer, an anti-oxidant, light stabilizer, an ultraviolet ray absorbent, lubricant, a coloring agent, an inorganic bulking agent, and a glass fiber, etc. can also be blended.

[0019] It can manufacture easily with general-purpose mixed equipment, for example, a hot calender roll, a Banbury mixer, or an extruder, without requiring a special means and a mixed sequence foreword as the mixed approach of the styrene resin in this invention, a thiourea derivative, a thioamide derivative, and a copper compound. A film or a sheet is easy to be manufactured according to the usual manufacturing method. It can manufacture by the T-die method by the extruder, the inflation-molding method, the calender fabricating method, and compression forming. Although there is especially no limit, as for the thickness of a film or a sheet, it is desirable that it is within the limits of 0.01-10mm. In addition, when increasing the reinforcement of a sheet further or attaching a pattern, the interior is made to contain the glass fiber network and the wire gauze made from stainless steel which knit and wove glass filament yarn in the shape of [of about 5mm angle] a grid, and they may be fabricated.

[0020]

[Function] carrying out heating kneading of the mixture which contained the copper compound of a general formula (I) or chlorophyll copper, sodium copper-chlorophyllin, bisacetylacetone copper, the thiourea derivative of a general formula (II), or the thioamide derivative of a general formula (III) like the above by the above-mentioned mixed approach at styrene resin the 800-2000nm whole region -- crossing -- about -- it comes to absorb a near infrared ray to Mr. one. So that clearly from the example and the example of a comparison which are shown below, although the reason is not clear even if it carries out heating kneading of a thiourea derivative, a thioamide derivative, or the copper compound independently at styrene resin, respectively And a near infrared ray is not absorbed about reinforcement. the 800-2000nm near infrared region whole region -- crossing -- about -- Mr. one -- If it carries out from the same being said of having mixed styrene resin, the thiourea derivative, the thioamide derivative, and the copper compound The mixture containing a thiourea derivative or a thioamide derivative, and a copper compound by carrying out heating kneading by the above-mentioned mixed approach to styrene resin A certain reaction occurs between a thiourea derivative or a thioamide derivative, and a copper compound, and it is presumed that it is because complex (complex) is generated.

[0021]

[Example] Although an example is hung up over below and detail of this invention is given, this invention is not restricted to these examples. In addition, all the addition rates in an example show the weight section.

[0022] Moreover, the transparency spectrum of the obtained resin ingredient is a spectrophotometer (Hitachi Make: 323 molds). It measured. the judgment of near infrared ray absorptivity -- the average of 900, 1000, and an absorption value with a wavelength [each] of 1100 or 1500nm made O and 30% or more **, and made [80% or more of thing] 30% or less x for O and 60% or more.

[0023] The heat of near infrared ray absorptivity, humidity, and the stability over light were measured by the following approach.

[0024] Thermal resistance and moisture resistance: It is a spectrophotometer again about the near infrared ray absorptivity after leaving a near infrared ray absorptivity sheet in the oven of 80 degrees C and 100%RH for 480 hours. (1000nm) It measured. The result computed by the following type estimated the shelf life.

[0025]

[Equation 1]

$$\text{保存率} = \frac{100 - \text{加熱・加湿後の透過率}}{100 - \text{加熱・加湿前の透過率}} \times 100(\%)$$

[0026] Lightfastness: Be about a near infrared ray absorptivity sheet with UV (ultraviolet rays) circuit tester (super-[made from Great Japan Plastics] promotion fading-test machine). It is a spectrophotometer again about the near infrared ray absorptivity after carrying out an optical exposure for 200 hours. (1000nm) It measured. The result computed by the following type estimated the shelf life.

[0027]

[Equation 2]

$$\text{保存率} = \frac{100 - \text{露光後の透過率}}{100 - \text{露光前の透過率}} \times 100(\%)$$

[0028] An injection molding machine is used for thermal stability. It fabricated with the laying temperature of 230 degrees C after [of the residence time] 20 minutes, color tone change of the obtained sample was measured with the color difference meter by Nippon Denshoku Co., Ltd., the color difference (deltaE) was searched for by the L.a.b. method, and it judged as follows.

O :superior O:fitness ** : nothing [YAKE] (yellow change size)

x: The thiourea compound 2 weight section and the copper compound of combination which are shown in one to YAKE owner example 23 table 1, and Table 2 It is polystyrene resin about the 0.2 weight sections. It adds in the 100 weight sections, mixes for 20 minutes by the tumbler mixer, and is 40mmphi extrusion briquetting machine. It was made the pellet after kneading at 220 degrees C. Subsequently, this pellet was dried and the green transparence resin plate which does not have Hayes with a thickness of 3mm using an injection molding machine was produced. The transparency spectrum was measured about these obtained plates. Although the result was shown in Table 5, it excelled in the absorptivity of a near-infrared region.

[0029] It is polystyrene resin about a thiourea compound and a copper compound at the combination and addition which are shown in 24 to example 33 table 2. It adds in the 100 weight sections, mixes for 20 minutes by the tumbler mixer, and is 40mmphi extrusion briquetting machine. It was made the pellet after kneading at 220 degrees C. Subsequently, this pellet was dried and the green transparence resin plate which does not have Hayes with a thickness of 3mm using an injection molding machine was produced. The transparency spectrum was measured about these obtained plates. Although the result was shown in Table 6, it excelled in the absorptivity of a near-infrared region.

[0030] The thioamide compound 2 weight section and the copper compound of combination which are shown in 34 to example 37 table 2 It is polystyrene resin about the 0.2 weight sections. It adds in the 100 weight sections, mixes for 20 minutes by the tumbler mixer, and is 40mmphi extrusion briquetting machine. It was made the pellet after kneading at 220 degrees C. Subsequently, this pellet was dried and the green transparence resin plate which does not have Hayes with a thickness of 3mm using an injection molding machine was produced. The transparency spectrum was measured about these obtained plates. Although the result was shown in Table 6, it excelled in the absorptivity of a near-infrared region.

[0031]

[Table 1]

熱可塑性樹脂の配合処方

実施例 No.	配 合 処 方 (重量部)				スチレン系樹脂
	チオ尿素化合物	処	銅化合物	物	
1	1,3-ジフェニルチオ尿素	2	p-クロロ安息香酸銅	0.2	PS 100
2	1,3-ジラウリルチオ尿素	2	"	0.2	PS 100
3	1,3-ジエチルチオ尿素	2	"	0.2	PS 100
4	1,3-ジメチルチオ尿素	2	"	0.2	PS 100
5	1,3-ジ-m-クロルフェニルチオ尿素	2	"	0.2	PS 100
6	1,3-ジフェニルチオ尿素	2	ステアリン酸銅	0.2	PS 100
7	"	2	ベヘン酸銅	0.2	PS 100
8	"	2	p-ニトロ安息香酸銅	0.2	PS 100
9	1,3-ジフェニルチオ尿素+1,3-ジクロロフェニルチオ尿素(1:1)	2	m-クロロ安息香酸銅	0.2	PS 100
10	1,3-ジフェニルチオ尿素	2	p-ブロム安息香酸銅	0.2	PS 100
11	"	2	安息香酸銅	0.2	PS 100
12	"	2	o-ベンゾイル安息香酸銅	0.2	PS 100
13	"	2	銅クロロフィル	0.2	PS 100
14	"	2	グルコン酸銅	0.2	PS 100
15	"	2	4-シクロヘキシル酢酸銅	0.2	PS 100

[0032]

[Table 2]

熱可塑性樹脂の配合処方

実施例 No.	配 合 処 方		(重量部)		スチレン系樹脂
	チオ尿素化合物/チオアミド化合物	銅 化 合 物			
16	1,3-ジフェニルチオ尿素	n-ドデシルベンゼンスルホン酸銅	2	0.2	PS 100
17	"	ナフタリンスルホン酸銅	2	0.2	PS 100
18	"	α -ナフチルリン酸銅	2	0.2	PS 100
19	"	ステアリン酸銅+m-クロル安息香酸銅(1:1)	2	0.2	PS 100
20	"	ステアリルリン酸銅	2	0.2	PS 100
21	"	酢酸銅	2	0.2	PS 100
22	"	コハク酸銅	2	0.2	PS 100
23	"	グルタル酸銅	2	0.2	PS 100
24	"	p-クロル安息香酸銅	2	0.4	PS 100
25	"	"	4	0.2	PS 100
26	"	"	1	0.2	PS 100
27	"	"	2	0.1	PS 100
28	1,3-ジ-m-クロルフェニルチオ尿素	"	2	0.4	PS 100
29	"	"	4	0.2	PS 100
30	"	"	1	0.2	PS 100
31	"	"	2	0.1	PS 100
32	1,3-ジラウリルチオ尿素	"	2	0.4	PS 100
33	"	"	2	0.1	PS 100
34	N-フェニルチオベンツアミド	"	2	0.2	PS 100
35	N-シクロヘキシルチオベンツアミド	"	2	0.2	PS 100
36	N-ステアリルチオベンツアミド	"	2	0.2	PS 100
37	チオアセトアニリド	"	2	0.2	PS 100

[0033] The thiourea compound 2 weight section and the copper compound of combination which are shown in 38 to example 41 table 3 It is styrene resin about the 0.2 weight sections. It adds in the 100 weight sections, mixes for 20 minutes by the tumbler mixer, and is 40mmphi extruding press machine. It was made the pellet after kneading at 220 degrees C. Subsequently, this pellet was dried and the green transparence resin plate which does not have Hayes with a thickness of 3mm using an injection molding machine was produced. The transparency spectrum was measured about these obtained plates. Although the result was shown in Table 6, it excelled in the absorptivity of a near-infrared region.

[0034]

[Table 3]

熱可塑性樹脂の配合処方

比較例 No.	配 合 処 方 (重量部)				スチレン系樹脂
	チ オ 尿 素 化 合 物	銅 化 合 物			
38	1,3 -ジフェニルチオ尿素	2	p -クロロル安息香酸銅	0.2	HIPS 100
39	"	2	"	0.2	AS 100
40	"	2	"	0.2	透明ABS 100
41	"	2	"	0.2	MAS* 100

*1 スチレン-メチルメタクリレート共重合体

[0035] Combination of the combination of example 42 example 1 is mixed for 20 minutes by the tumbler mixer, and it is 40mmphi extruding press machine. It sheet-ized to 1mm thickness by the T-die fabricating method at 220 degrees C. The temperature of a cooling roller was 95 degrees C. The thermal insulation effectiveness of the obtained near infrared

ray absorptivity sheet was measured using the equipment shown in drawing 1 . As for the incandescent lamp of 60W, and 2, 1 is [a test portion and 3] precision thermometers. The result was as drawing 2 . Although A in drawing shows the thermal insulation effectiveness of a near infrared ray absorptivity sheet, the comparison with B which showed the thermal insulation effectiveness of the usual polystyrene resin which does not contain the near infrared ray absorbent shown in this drawing shows excelling in the thermal insulation ability of a near-infrared region. Moreover, although this resin sheet comparatively often penetrated the light of a visible region so that the comparison with the transparency spectrum B of the usual polystyrene resin sheet which does not contain the near infrared ray absorbent shown in this drawing might show, although A in drawing 3 shows the transparency spectrum of the obtained transparence resin sheet, it excelled in the absorbing power of the near-infrared region which is not looked at by the usual polystyrene resin sheet.

[0036] It is polystyrene resin at independent respectively about the thiourea compound shown in one to example of comparison 9 table 4, a thioamide compound, or a copper compound. It adds in the 100 weight sections, mixes for 20 minutes by the tumbler mixer, and is 40mmphi extrusion briquetting machine. It was made the pellet after kneading at 220 degrees C. Subsequently, this pellet was dried and the green transparence resin plate which does not have Hayes with a thickness of 3mm using an injection molding machine was produced. Although the transparency spectrum was measured about these obtained plates and the result was shown in Table 6, there was only 30% or less of near infrared ray absorptivity altogether.

[0037]

[Table 4]

熱可塑性樹脂の配合処方

比較例	配 合 処 方 (重量部)		
	チオ尿素化合物／チオアミド化合物	銅 化 合 物	スチレン系樹脂
No.			
1	—	—	PS 100
2	1,3 -ジフェニルチオ尿素	—	PS 100
3	1,3 -ジラウリルチオ尿素	—	PS 100
4	1,3 -ジ- <i>m</i> -クロルフェニルチオ尿素	—	PS 100
5	N-フェニルチオベンゾアミド	—	PS 100
6	N-シクロヘキシルチオベンゾアミド	—	PS 100
7	—	p-クロル安息香酸銅	PS 100
8	—	ベンゼン酸銅	PS 100
9	—	ステアリン酸銅	PS 100

<EMI ID=000012 HE=210 WI=090 LX=0600 LY=0300> [0038]
[Table 5]

近赤外線吸収性樹脂の評価結果

	単 位	実 施 例																								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
近赤外線吸収性	—	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
耐熱性、耐光性	%	98	96	95	94	98	97	97	96	98	95	98	97	97	95	95	97	96	97	96	95	91	92	92	97	96
耐光性	%	97	96	95	92	97	96	96	96	97	91	97	94	91	90	92	95	95	93	95	93	88	90	98	97	96
熱安定性	230℃×20分 ΔE	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

[0039]
[Table 6]

近赤外線吸収性樹脂の評価結果

	单 位	实 施 例												比 較 例												
		26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	1	2	3	4	5	6	7	8	9
近赤外線吸収性	—	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	×	×	×	×	×	×	×	×	×
耐熱性、耐湿性	%	97	96	94	95	98	97	97	95	98	97	97	92	98	97	97	92	—	—	—	—	—	—	—	—	—
耐 光 性	%	97	95	93	92	83	90	80	92	83	90	80	90	83	90	80	90	—	—	—	—	—	—	—	—	—
熱安定性	230℃×20分 ΔE	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

[0040] It is clear the sheet's of the styrene resin which kneaded the thiourea compound or the thioamide compound, and the copper compound according to Table 5 and Table 6 to become a strong near infrared ray absorptivity sheet. Moreover, this near infrared ray absorptivity hardly falls by heating, humidification, or exposure, but it turns out to change of the environmental condition of handling or preservation that it is extremely stable. In addition, the sheet of the styrene resin which kneaded independently the thiourea compound, the thioamide compound, or the copper compound did not show near infrared ray absorptivity substantially.

[0041]
[Effect of the Invention] Since there is no instability, such as tenebrescence, and the photochromism of carrying out

tenebrescence to a dark place by prolonged neglect is not seen, either but the resin ingredient which carries out heating kneading of the near infrared ray absorption styrene resin constituent of this invention, is fabricated a sheet or in the shape of a film, and changes shows the outstanding near infrared ray absorptivity, it is industrially useful as optical filter and heat ray absorptivity grading material etc. Moreover, obtained near infrared ray absorption sheet It has the strong absorptivity across which it goes throughout a 800-2000nm near infrared region. It can use by using these properties as optical materials, such as a near infrared ray cut-off filter, a record ingredient, a heat ray shielding material, an accumulation ingredient, a near infrared ray detection sensor, etc. Although the constituent of this invention contains the metal, since there is little coloring, molding objects containing these, such as a sheet and a film, become the thing excellent in the appearance.

[Translation done.]